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1 Fast detection of communication patterns in distributed executions

Thomas Kunz, Michiel F. H. Seuren

November 1997 **Proceedings of the 1997 conference of the Centre for Advanced Studies on Collaborative research**Full text available: [pdf\(4.21 MB\)](#) Additional Information: [full citation](#), [abstract](#), [references](#), [index terms](#)

Understanding distributed applications is a tedious and difficult task. Visualizations based on process-time diagrams are often used to obtain a better understanding of the execution of the application. The visualization tool we use is Poet, an event tracer developed at the University of Waterloo. However, these diagrams are often very complex and do not provide the user with the desired overview of the application. In our experience, such tools display repeated occurrences of non-trivial commun ...

2 Educating software engineering students to manage risk

Barry Boehm, Daniel Port

July 2001 **Proceedings of the 23rd International Conference on Software Engineering**Full text available: [pdf\(1.10.12 KB\)](#) Additional Information: [full citation](#), [abstract](#), [references](#), [index terms](#)
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In 1996, USC switched its core two-semester software engineering course from a hypothetical-project, homework-and-exam course based on the Bloom taxonomy of educational objectives (knowledge, comprehension, application, analysis, synthesis, evaluation). The revised course is a real-client team-project course based on the CRESST model of learning objectives (content understanding, problem solving, collaboration, communication, and self-regulation). We used the CRESST cognitive demands analysis ...

Keywords: process models, product models, project courses, property models, risk management, software engineering education, success models

3 Establishing Ada repositories for reuse

B. Kitaoka

January 1989 **Proceedings of the conference on Tri-Ada '89: Ada technology in context: application, development, and deployment**Full text available: [pdf\(015.27 KB\)](#) Additional Information: [full citation](#), [abstract](#), [references](#), [index terms](#)

Ideally, a software reuse repository is a robust, dynamic interchange among software

designers. This constantly growing and improving resource assists with—and influences—the creation of quality, cost-efficient software systems. Setting this process in motion and sustaining its momentum calls for many of the approaches used in system design and development. Its stable yet flexible structure anticipates the technical requirements of present and future users. But the su ...

4 Formalising ERP Selection Criteria

Xavier Burgués Illa, Xavier Franch, Joan Antoni Pastor

November 2000 **Proceedings of the 10th International Workshop on Software Specification and Design**

Full text available:  [pdf\(149.99 KB\)](#)



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We present a proposal for selecting ERP products from a formal description of their relevant characteristics. The work is based on a previous and successful collaboration with a midsize company in the field of software package selection. An ERP was selected following a systematic methodology called SHERPA. In this past experience, SHERPA relied on natural language descriptions of the application domain, user needs and candidate ERP solutions. In this paper, we show that a formal language may be ...

Keywords: Software selection, requirements specification, ERP

5 Future of simulation: Simulation in the international IIMS MISSION project: the IIMS MISSION architecture for distributed manufacturing simulation

Charles McLean, Frank Riddick

December 2000 **Proceedings of the 32nd conference on Winter simulation**

Full text available:  [pdf\(269.47 KB\)](#) Additional Information: [full citation](#), [abstract](#), [references](#), [citations](#)



This paper presents an overview of a neutral reference architecture for integrating distributed manufacturing simulation systems with each other, with other manufacturing software applications, and with manufacturing data repositories. Other manufacturing software applications include, but are not limited to systems used to: 1) design products, 2) specify processes, 3) engineer manufacturing systems, and 4) manage production. The architecture identifies the software building blocks and interface ...

6 Witan web and the software engineering of web-based applications

J. Howard Johnson, Stephen A. Mackay

November 2000 **Proceedings of the 2000 conference of the Centre for Advanced Studies on Collaborative research**

Full text available:  [pdf\(653.32 KB\)](#) Additional Information: [full citation](#), [abstract](#), [references](#), [index terms](#)



WitanWeb is a web-based application that supports the interactions among program committee members, authors, and reviewers for the refereeing process of conferences. Since development began in 1997, it has evolved a great deal to support the requirements of CASCON, WWW8, and ICSE 2001 as well as several other significant conferences. The development focus has emphasized usability related to the task as well as security, integrity, and availability to encourage the development of trust by each cl ...

7 A component model for standardized web-based education

L. Anido-Rifón, M. Llamas-Nistal, M. J. Fernández-Iglesias

April 2001 **Proceedings of the tenth international conference on World Wide Web**

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Keywords: Learning technology standardization, Web-based course delivery systems, authoring tools, collaborative systems, educational web applications, learning technology, practice and experience

8 Tool-based approach to distributed database design: includes Web-based forms design for access to academic affairs data

David A. Owens, Frederick T. Sheldon

February 1999 **Proceedings of the 1999 ACM symposium on Applied computing**

Full text available:  pdf(806.36 KB) Additional Information: [full citation](#), [references](#), [index terms](#)



Keywords: ORACLE, Web, academic affair, database, distributed

9 Reusable software components

Trudy Levine

June 2000 **ACM SIGAda Ada Letters**, Volume XX Issue 2

Full text available:  pdf(638.38 KB) Additional Information: [full citation](#), [index terms](#)



10 Applications: Achieving interoperability for integration of heterogeneous COTS geographic information systems

Shengru Tu, Liang Xu, Mahdi Abdelguerfi, Jay J. Ratcliff

November 2002 **Proceedings of the tenth ACM international symposium on Advances in geographic information systems**

Full text available:  pdf(105.88 KB) Additional Information: [full citation](#), [abstract](#), [references](#), [index terms](#)



Using multiple commercial off-the-shelf (COTS) GIS suites is a common phenomenon, because different COTS products often have different strengths in various applications. On the other hand, deploying heterogeneous GIS software has the tendency to form fragmented data sets and to cause inconsistency. Data consolidation is an effective way to preserve data integrity. To accomplish this, we must achieve interoperability between different GIS tools. While vector spatial data have the standard databases ...

Keywords: COTS-based systems, GIS, J2EE, interoperability, system integration

11 Reusable software components

Trudy Levine

July 1996 **ACM SIGAda Ada Letters**, Volume XVI Issue 4

Full text available:  pdf(2.45 MB) Additional Information: [full citation](#), [index terms](#)



12 A fault-tolerant software architecture for COTS-based software systems

Paulo Astério de C. Guerra, Cecília Mary F. Rubira, Alexander Romanovsky, Rogério de Lemos
September 2003 **ACM SIGSOFT Software Engineering Notes, Proceedings of the 9th European software engineering conference held jointly with 11th ACM SIGSOFT international symposium on Foundations of software engineering**, Volume 28 Issue 5

Full text available:  pdf(186.00 KB) Additional Information: [full citation](#), [abstract](#), [references](#), [index terms](#)



This paper considers the problem of integrating Commercial off-the-shelf (COTS)

components into systems with high dependability requirements. Such components are built to be reused as black boxes that cannot be modified. The system architect has to rely on techniques that are external to the component for resolving mismatches between the services required and provided that might arise in the interaction of the component and its environment. The paper puts forward an approach that employs the lay ...

Keywords: COTS-based, fault-tolerance, software architecture

13 A lifecycle process for the effective reuse of commercial off-the-shelf (COTS) software

Christine L. Braun

May 1999 **Proceedings of the 1999 symposium on Software reusability**

Full text available:  [pdf\(949.66 KB\)](#) Additional Information: [full citation](#), [references](#), [index terms](#)

Keywords: COTS, architectures, life-cycle process, product lines, reuse

14 Key to effective video retrieval: effective cataloging and browsing

Dulce Ponceleon, Savitha Srinivasan, Arnon Amir, Dragutin Petkovic, Dan Diklic

September 1998 **Proceedings of the sixth ACM international conference on Multimedia**

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Keywords: cataloger, digital library creation, multiview storyboard, speech recognition, video annotation, video search and browse, video segmentation

15 Component-based software engineering: A support system to COTS-based software development for business services

Stefania Bandini, Flavio De Paoli, Sara Manzoni, Paolo Mereghetti

July 2002 **Proceedings of the 14th international conference on Software engineering and knowledge engineering**

Full text available:  [pdf\(160.45 KB\)](#) Additional Information: [full citation](#), [abstract](#), [references](#)

The work described in this paper deals with the problem of selecting, configuring, integrating and deploying COTS components to deliver tailored software systems. Since formal and precise description of components is not usually available, a reasonable approach is to augment the available documentation with the informal knowledge derived by practices and experience of experts. The development of a knowledge-based system is a way to organize this empirical knowledge and deliver a tool that can su ...

16 Reusable software components

Trudy Levine

July 1998 **ACM SIGAda Ada Letters**, Volume XVIII Issue 4

Full text available:  [pdf\(897.86 KB\)](#) Additional Information: [full citation](#), [index terms](#)

17 Pilot Command Center Testbed development environment: a better way to develop C³ systems

Charles R. Grauling

December 1991

Proceedings of the conference on TRI-Ada '91: today's accomplishments; tomorrow's expectations

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18 Lessons learned during requirements acquisition for COTS systems 

Neil A. M. Maiden, Cornelius Ncube, Andrew Moore

December 1997 **Communications of the ACM**, Volume 40 Issue 12

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19 Large-scale space object tracking using APL2 

Jack G. Rudd, Richard A. Marsh, Marcus L. Munger

July 1998 **ACM SIGAPL APL Quote Quad, Proceedings of the APL98 conference on Array processing language**, Volume 29 Issue 3

Full text available:  pdf(701.57 KB) Additional Information: [full citation](#), [abstract](#), [references](#), [index terms](#)

The number of space objects in earth orbit has increased steadily from the launch of the first space object (Sputnik) to the current level of approximately 10,000. The North American Defense Cheyenne Mountain Operations Center (CMOC), operated by the United States and Canada, provides continuous tracking of this growing constellation of space objects, including active and inactive satellites and space debris. This mission is accomplished for the most part using radar stations and ground-based op ...

20 The software customer/supplier relationship 

Pearl Brereton

February 2004 **Communications of the ACM**, Volume 47 Issue 2

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It's a delicate, dynamic relationship that changes with time, demands, and different approaches to procurement.

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Model-based performance analysis of an EDP/ERP-oriented wide area network

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ABSTRACT

In this paper we describe the operational phases of a model-based performance analysis activity performed on the EDP/ERP WAN deployed by FIAT Auto, S.p.a. in Argentina.

Keywords

Performance Modeling, Performance Prediction, Wide-Area Network, EDP, ERP.

1. INTRODUCTION

The Problem consists in the performance evaluation of a large network composed by processing nodes and geographic links. The network is devoted to face real time problems originated by financial, commercial and production environments operating according to an integrated strategy. The nodes are defined as a collection of multiprocessor, tightly coupled processing units. Inside a node, one or more processing units are devoted to handle the applications and the database management, or are configured as redundant resources to support continuous operation requirements. Processing units are connected via a Local Area Network, which also connects the user community to the application servers. Commercially available routers are deployed to support the communication requirements between nodes.

2. MODELING

On board of each node several application environments were defined, hence implying a typical multi-class scenario. Application environments originate both local requests addressed to processing units belonging to the same LAN and remote requests addressed to processing units allocated on different nodes, hence competing for system resources with the local activities.

2.1 Modeling Approach

The whole configuration can be considered as a "puzzle" in which the visible pattern is originated as a replication of archetypal objects such as processors, memories, I/O ports, physical links, protocols, routers, O.S. kernels, access methods, data bases, etc... The first

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modeling step consists in the achievement of a SIMPLE archetypal model for each of the above components.

2.1.1 Model Validation

The above archetypal models can be gathered in a reusable set of component-level model libraries. A validation step is necessary to check whether the predicted figures for each of the above components are consistent with the related "real world" performance behaviors. A data collection activity was hence planned, and the related figures were compared with the predicted ones. This step was repeated to achieve a consistent confidence interval between predicted and measured data.

2.1.2 System Modeling

The previous steps were devoted to provide libraries describing the components required for the model definition. The current one is addressed to build the system-level model. A large network model is an aggregation of occurrences of many archetypal objects generated by properly setting, inside the archetypal object, the global configuration variables used to parameterize the object. From the above considerations, such a model can be defined as a collection of instances of the archetypal models. The concept of global configuration variable is general: all architectural and implementation options can be represented in this way. Relevant parameters such as pool sizes, buffer sizes, policies, strategies, disciplines and so on can be assigned at configuration time without modifying the model libraries.

2.1.3 Advantages

This method supports a structured approach to the problem: while modeling a large network, many of the archetypal models can be instanced more than once. This results in advantages in the model readability, re-usability and maintainability. A relevant aspect is represented by the reduction of the model code, hence reflecting in the time/cost paradigm of the modeling activity. Using this approach, the above described WAN was modeled with a 2m/m effort.

3. THE TOOL

Following several tests, it was agreed with the customer that a simulation tool was not suitable to guarantee the achievement of the results. The instantiation process underlying this approach requires more sophisticated algorithms. After the model has been generated, a visiting process of the defined components becomes necessary to collect system-level resource demand profiles. Considering the complexity of the real system, this visiting process can become long and somewhat cumbersome. To overcome this

problem, a performance modeling and prediction tool grounded on symbolic execution principles has been selected. The main advantage of this technology proved to be its efficiency: the visiting process related to the whole system model required a ten-minutes run on a standard Pentium(tm) PC. The tool is PREDICTA 2.1, developed by Performance Research (<http://www.predicta.it> or <http://www.pr-usa.com>). It provides a solution allowing the model designer to build up a system-level model from a set of model libraries describing market-standard and Commercial-Off-The-Shelf (COTS) networking components.

3.1 The Computing Process

After the symbolic execution process has been accomplished, the tool produces the model queuing network script by inspecting the collection of the resource demand profiles. This phase is devoted to build up a hierachic model suitable to be solved producing useful performance parameters such as arbitration times, semaphore wait times and coefficients of utilization. To achieve this, the queuing network script is compiled and linked with a queuing network algorithm library and the resulting task is executed.

3.2 The Results

The performance figures are well suited to individuate bottlenecks in the model. Inside a hierachic model, the starvation of an innermost component can imply that some of the outermost ones may appear as bottlenecks. The figures produced by PREDICTA have been conceived to individuate the primary bottleneck. A failure in the bottleneck analysis leading to a corrective action addressed to enhance the performances of a secondary bottleneck generates a slower and less efficient system, despite of the related costs.

4. THE PROBLEM SOLVING ACTIVITY

A performance prediction activity addressed to a large network requires peculiar considerations: as a primary point we have the widespread use of market standard components. It may appear that a performance analyst, even when the existence of a problem inside a COTS component has been demonstrated, has no chance of recommending any modification and/or improvement in its internal design. The outcomes of this activity prove that much more can be done.

4.1 How to Use the Results

The outcomes of this performance analysis activity provided a support to the customer in checking its proposed solutions. The designer's opportunities can be summarized as follows: a) the redefinition of some aspects of the application architecture; b) the utilization of different HW and/or SW components; c) a tuning action on the configuration (e.g. the adoption of a larger memory, of a faster disk etc.) Among the above options, the first one proved to be the most fruitful. It is clear that, when a corrective action is necessary, the modeling effort to describe the action and predict its results plays a fundamental role. Using PREDICTA, the design alternative analysis was easily executed by means of a low-cost re-configuration activity. The related advantages in terms of costs against benefits could be quickly investigated.

4.2 Improving Response Times

A large network should give answer to the expectations of different classes of users, and, in many circumstances, the application

environment requires to access data allocated in remote nodes. In this case the response time, as experimented by the user, is composed by contributions originated by the residence time on several system components. The time required to get service by I/O ports, routers, physical links, protocols, transportation layers, interrupt handlers, etc., represented a non-negligible fraction of the whole response time. The result, in terms of response time reduction, obtained by enhancing a single component were in general poor and was hence required to enhance the whole chain of components involved in the operations. This action always represents an expensive approach to the problem. A large network represents a constrained environment in which progresses are slow and expensive and where common sense-driven actions can be dangerous.

4.2.1 Tuning Actions

The related user perception was poor. We distinguish among the following possible actions: a) tuning actions related to the kernel configuration; b) tuning actions related to the database management; c) tuning actions related to the buffering conditions. About the first point it appeared that the kernel tuning, as proposed by the system manufacturer, was satisfactorily performing and just in peculiar situations a tuning action could result in advantages. The tuning actions related to the database management (e.g. reducing the number of tables requiring a scansion, replacing the selection sequence with a more efficient one, compacting data, etc...) proved to be more effective in achieving advantages. About the buffering condition tuning actions, in most cases expectations were not confirmed by the field results: in particular a very large buffer pool size, when used to tune databases, implies the consumption of more computing resources.

4.2.2 Multiprocessor Environments

Attention has to be paid to the symmetric, multiprocessor environment. This analysis demonstrates that processing units with a large number of processors can behave in two main ways. When the real time issues are low, the kernel overhead and the related spin loop synchronization between processes do not represent an unacceptable loss. When the system is involved in severe real time issues, the number of concurrent processing increases and the synchronization activities represent a significant loss. It appeared that no advantages could be achieved by enhancing the processing unit from six to eight processor. The output data from the modeling activity demonstrated that the increase in computing power achieved by this enhancement equates the increase of the synchronization losses originated by the larger number of processors competing for the inner kernel services.

4.2.3 Memory Size

Memory starvation for a processing unit involved in severe real time activities is a disaster. For a large processing unit with severe real time issues, the number of the active processes can reach very high values. The presence of paging activities can increase the inner kernel service requests per unit time. A collapse of the system performances becomes possible in this case.

5. ACKNOWLEDGMENTS

Many thanks to Mr. Gianluigi Castelli, Chief IT Officer of FIAT Auto, S.p.A. for the high-profile collaboration offered by its group and for allowing us to report about this challenging activity.